

Report on an Informal Workshop on Geothermal Facility Siting Issues at Federal Lands

**Held at the
National Renewable Energy Laboratory
Golden, Colorado**

November 14-16, 2000

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Abstract

An informal workshop on issues relative to geothermal facility siting at Federal lands was convened at the National Renewable Energy Laboratory on November 14-16, 2000. This report summarizes the workshop's presentations, discussion, and priority recommendations. The participants agreed that significant facility siting issues are impeding the development of geothermal energy resources in the United States. They recommended several actions; among these were development of a national policy on renewable energy, coordination among Federal agencies involved in geothermal permitting processes, and the establishment of a National Geothermal Coordinating Committee.

Report on an Informal Workshop on Geothermal Facility Siting Issues at Federal Lands

Introduction

The National Renewable Energy Laboratory, with the Geothermal Energy Association and the Idaho National Engineering and Environmental Laboratory, organized an Informal Workshop on Geothermal Facility Siting Issues at Federal Lands. Participants included representatives of the geothermal industry, California Energy Commission (CEC), and Federal agencies, including the U.S. Department of Energy (DOE), the U.S. Bureau of Land Management (BLM), the U.S. Forest Service (USFS), the U.S. Fish and Wildlife Service (FWS), the U.S. Minerals Management Service (MMS), national laboratory staff, and independent consultants. The workshop was held at the National Renewable Energy Laboratory (NREL) on November 14-16, 2000.

The workshop was designed to further the discussion begun at an informal kick-off workshop on September 26, 2000, at the Geothermal Resource Council Annual Meeting in San Francisco, California. Participants in that meeting, which included geothermal industry and Federal officials, agreed that geothermal facility siting issues are important to the expanded use of geothermal energy in the United States. They requested continuing discussion to better define these issues and to suggest and recommend potential solutions.

From a discussion among the participants at the November workshop, a general consensus emerged about the nature of problems facing geothermal siting at Federal lands, as well as suggested solutions to the problems. The workshop participants agreed that significant barriers to the development of geothermal energy exist. This report, based on notes taken at the workshop, presents a summary of the presentations made, a summary of the workshop discussion, and the consensus recommendations resulting from the workshop in priority order. A workshop agenda and a participant list are included.

Notes from an Informal Workshop on Geothermal Facility Siting

November 15, 2000

National Renewable Energy Laboratory, Golden, Colorado

Summary of Presentations at the Workshop

This section summarizes remarks by the workshop's presenters. These include comments by Peter Goldman, DOE; Karl Gawell, Geothermal Energy Association; David McClain, independent consultant; Bob Therkelson, CEC; Rich Hoops and Miyosha Stith, BLM; Steve Blazek, DOE; Randy Sharp, USFS; John Herrick, DOE; and Barbara Farhar, NREL.

Peter Goldman, Geothermal Program Manager, DOE

The DOE believes that geothermal energy development in the United States could be enhanced by improved siting processes for facilities at Federal lands. The U.S. Department of the Interior BLM, with concurrence of the U.S. Department of Agriculture USFS, is the agency primarily responsible for permitting decisions. The potential contributions of renewable energy sources such as geothermal are important in the U.S. energy mix, yet it takes from 4 to 6 years for applicants to obtain permits for geothermal projects. A reasonable time frame is needed for permitting geothermal projects. In the meantime, while geothermal development has been delayed, there has been \$2 billion in wind development, mostly on private land. Geothermal siting issues today are wind siting issues tomorrow. We need to understand the permitting decision processes. A national coordinating committee might help with this.

Geothermal Facility Siting Issues—An Industry Perspective

Karl Gawell, Geothermal Energy Association

From the industry standpoint, geothermal facility siting on Federal lands is seen as a difficult and significant issue requiring immediate action. Siting processes must be improved. The U.S. government is compensated by royalties from companies with 2200 MW of operating geothermal capacity in the United States.

Several siting problems were identified:

- \$ **Expense:** Siting a geothermal facility is very expensive — often requiring \$10 million in up-front administrative expenses for the plant and multiple millions of dollars for other permitting procedures and processes required for leasing, rights of way, etc.
- \$ **NIMBY:** The not-in-my-backyard (NIMBY) syndrome is ubiquitous and persistent.
- \$ **Delays in siting:** Any environmental impact statement (EIS) more than 2 years old can be considered outdated, yet the EIS decision process itself is taking more than 2 years. The whole leasing, permitting, and EIS process takes even longer and begs more process. By the time an applicant is done, the applicant needs more process to update the process.

- \$ **Uncertainty:** Section 106 of the Historic Preservation Act provides for consultation, but the process is unclear. Calpine and Calenergy are large companies that have been stretched to their limits in dealing with Section 106 consultation requirements in the Medicine Lake situation. How could any medium- or small-sized geothermal company deal with this?
- \$ **Repetition:** The process requires that the same issues be revisited repeatedly. This requires endurance on the part of the companies attempting to get a project permitted. A number of geothermal companies have already decided that they won't attempt a project on public lands given the current situation.

Geothermal Facility Siting Issues at Federal Lands—Problems and Solutions

David McClain, Independent Consultant, D.W. McClain & Associates Corp.

From a consultant's viewpoint, CEC has worked more efficiently to achieve permitting of geothermal facilities than have Federal agencies. The CEC has a policy of encouraging renewable energy projects and can balance differing and conflicting priorities. Lacking a national renewable energy policy, agencies such as the Bureau of Indian Affairs, BLM, and USFS give highest priority in timeliness and staff effort to other matters. Although BLM has the authority to issue permits, it hasn't taken the leadership role in geothermal siting processes. Two U.S. Department of Interior agencies—BLM and FWS—along with the USFS have conservation habitat and fire reduction, not geothermal energy development, as their top priorities. National priorities emphasize natural gas. Federal agencies such as the USFS are reluctant to approve a 30-MW geothermal project on Federal lands when they believe that it is not a priority policy and that the same 30 MW of energy could be developed by building a gas power plant in an industrial park. An EIS for a 30-MW geothermal plant on Federal lands takes from 3 to 4 years to complete and costs \$3 million to \$4 million. Federal agencies provide opponents, or potential opponents, to geothermal facilities with plant siting forums and preferential treatment. Often, case histories show that Federal agencies go out of their way to locate opponents to projects to make sure that every stakeholder is included, but often avoid opponents when it comes to timber policy issues. This appears to reflect an anti-geothermal stance. The California process, which is quasi-judicial, requires testimony and facts. This is seen as preferable over Federal processes. Because the Federal permitting process is slow—up to 10 years—companies desiring to site plants cannot get financing until all power plant pre-construction approvals and appeals have been finalized. The Interior Board of Land Appeals (IBLA) process should be reformed to decrease the years it currently takes to resolve appeals, as should the Section 106 process of the Historic Preservation Act and the Environmental Justice requirements of the U.S. Environmental Protection Agency (EPA). As part of good professional practice, geothermal developers should establish early rapport with Native Americans, local community representatives, constituents, and agency personnel.

Geothermal Facility Siting Issues—State Perspectives

Bob Therkelson, CEC, representing the State of California

California's statewide energy demand is continuing to grow at 2% per year. Meeting this demand requires the State to build the equivalent of two 500-MW power plants each year. About half of the existing in-State generation is more than 30 years old; these plants are less reliable and more polluting than newer plants. It would take the equivalent of fifty 500-MW power plants to replace the older plants. The CEC issues permits for the siting of projects \$50 MW on all lands, including Federal lands, in the State of California. Most projects are permitted in a 12-month process that consolidates all State and

local reviews. California also established a 6-month permit process for projects not expected to result in significant adverse environmental impacts. Some geothermal projects may be able to qualify for this process. California has also set up a “green team” to provide information on permitting. Information on the CEC process and all the current cases are posted on the CEC’s website (www.energy.ca.gov). The California regulatory environment is different from that in other parts of the nation, with often stricter environmental requirements and a high level of public involvement in permitting processes. Developers should be aware of these differences and should be prepared to submit specific, definitive information about their projects. While there is a clear interest in developing new sources of electrical generation, the environmental community in particular wants expedited permitting applied to projects that have no significant adverse environmental impacts or land-use conflicts. The CEC has worked with several Federal agencies in permitting 12 projects, including several geothermal projects. A process clearly defined in advance is crucial for successful State and Federal permitting. The process should include clear roles and responsibilities, a schedule, and conflict-resolution procedures. The electricity system is becoming more dependent on natural gas. This lack of diversity could have significant long-term negative consequences. Policies regarding the role of renewables in the power-generation mix are not well defined at the State or national levels. When decisions are being made regarding limited resources, clarification of these policies is needed to provide direction to project developers and regulators.

Rich Hoops, BLM, representing the State of Nevada

Nevada’s objective is to work with developers. The State maintains a good working relationship with BLM, and Federal, State, and local jurisdictions work closely together. Certain permit requirements apply at all levels, and the agencies share inspection responsibilities—they are not concerned about turf. The environmental review required in Nevada is not as stringent as in other States, requiring only an environmental assessment (EA) rather than an EIS, which saves resources. Permitting processes take from 3 months to 1 year, whether on private or public lands. Because Nevada has national monuments and forest service roadless areas, Nevada officials are concerned that these lands might be withdrawn from development and that BLM and USFS might be reluctant to adopt a multiple-use perspective for these lands. Also, Nevada is beginning to see social issues requiring follow-up. Another key need from the State perspective is to find procedural closure on Indian cultural values. The State is supportive of sessions like this workshop and other sessions in California and Nevada to involve groups in discussion—including environmental and industry groups.

Geothermal Facility Siting Issues—Federal Perspectives Miyosha Stith, BLM Headquarters

The flat budget of the BLM minerals program has affected the geothermal program more than other BLM programs; hence, geothermal is not a visible program in BLM. BLM has a limited budget for geothermal siting, even though the Geothermal Steam Act gave BLM responsibility for geothermal leasing. Societal issues such as Native American values and homeowner associations’ concerns are difficult to address and are not fully understood. Therefore, they are difficult and time consuming to resolve; BLM could better address these issues if additional funding was available. At times, project opponents neglect to acknowledge that a geothermal lease gives the operator certain rights. Also, the complexity of relationships among the agencies involved in permitting increases the time required to deal with permit processes. The Geothermal Steam Act requires BLM to be the lead agency for geothermal development with concurrence from other agencies, yet BLM is not vigorously pursuing its lead role. BLM has the lead in permitting, and National Environmental Protection Act (NEPA) review should be implemented through

BLM. BLM should develop a communications or outreach plan for up-front coordination with interested parties. Industry should present a uniform scenario to interested parties so that BLM does not have to referee disputes among companies. On December 6, 2000, BLM is planning to announce draft geothermal unit regulations that BLM field offices will be sending to BLM headquarters.

Steve Blazek, DOE, Golden Field Office

DOE's role is to provide financial assistance to geothermal energy projects. DOE decides whether to fund a project. While information typically gathered through the NEPA process could be valuable to the geothermal project selection process, the NEPA review occurs *after* the project is selected. The process is "NEPA-heavy" at the back end; a project's viability is not fully determined until well after financial assistance has been awarded. This leaves the NEPA process as an expensive, time-consuming, and cumbersome task at the back-end of the overall award and implementation process. BLM has statutory responsibility for approving geothermal projects on Federal lands under the Geothermal Steam Act. DOE would like to explore its relationship with BLM on NEPA review of projects to determine whether and how DOE could add value to the environmental review process, thereby improving DOE's ability to select and ultimately implement geothermal projects.

Randy Sharp, USFS, Modoc National Forest

USFS has received an increase in its budget for minerals management, but priority has been given to the administration of *existing*, not new, operations. There is no priority at this time to approve new operations, which is a concern for geothermal permitting processes. USFS manages lands under a multi-use concept. USFS permitting processes used to be more streamlined. Now things are more complex. New directives State that NEPA requires dealing with social issues. Executive Order 12898 on environmental justice means that agencies such as the USFS have to incorporate this new complication into their procedures. Although the USFS is very good at dealing with physical and biological issues, social-issue analysis is a new "resource" for the Forest Service. This new requirement lengthens the permitting process. The participants said that other Federal agencies have other missions that are far more important to them than geothermal energy. There is no support for geothermal among the Federal agencies involved. The USFS does not "hear" from a public that supports geothermal energy, and the public that opposes geothermal has advocates who get to agencies ahead of the USFS. Competitiveness among companies is another issue.

John Herrick, DOE, Golden Field Office **Legal Aspects of Geothermal Siting**

Regarding the legal aspects of geothermal energy, with respect both to private development and development on Federal lands, western water and mineral law are related to geothermal energy. Western States water law focuses on appropriation rights. State law predominates in this area, and this can create problems in the geothermal context. In water law, there are surface rights and subsurface rights. Appropriation law says that users do not necessarily have rights to water unless they used the water earlier. Subsurface owners are superior to surface owners. If the resource is on two properties, one could drill the other's resource. In water law, a person could go after subsurface geothermal resources if he had prior use. The Geothermal Steam Act of 1970 is a legal landmark for geothermal development on Federal land. Prior to this law, when the Federal government leased mineral rights under a patent, it was unclear whether the patent included geothermal resources. Today, geothermal is considered a fluid. If the

Federal government gave surface rights to a rancher, the rancher can use the water, but he cannot drill for geothermal water. The Geothermal Steam Act led to a special geothermal leasing program separate from mineral leasing. Rights were bid out for the person who could best use the resource. Before 1970, geothermal resources could be mined under a claim; that claim could be converted into a geothermal lease.

The Geothermal Steam Act does not preempt State water law. Someone operating a water right has precedence over a new geothermal lease. In *Occidental Geothermal v. Simmons*, the case decision shows that if a company has a geothermal lease, it has implicit rights to generate power. Under mining law, a person would have surface rights because geothermal is not transportable. It is now a standard in every Federal lease that surface facilities needed to produce power are guaranteed. If water is evaporated as part of the facility, this is considered a “consumptive use.” The user has to account for the water; a water permit is required through the State water agency. If someone wants to develop water in the west, they have to go to State agencies. If the proposed development is on private land, they have to buy into someone else’s appropriation.

Barbara Farhar, NREL

Summary of Prior Workshop on Geothermal Facility Siting, September 26, 2000, held in San Francisco, California

An informal workshop was held at the Geothermal Resources Council Annual Meeting to discuss geothermal facility siting issues on Federal lands. The participants at the San Francisco workshop pointed out that, of the 2800 MW of geothermal energy currently being produced, 2200 MW are on Federal lands; the trend for the future is the same. The San Francisco participants noted geothermal project siting delays—with Medicine Lake an example of a worst-possible example—and they expressed concern that siting delays appear to be worsening. Multiple agency involvement in permitting decisions and lack of coordination among agencies lead to a “chasm” in decision making. The latest laws and executive orders make geothermal siting difficult, they said. Native American tribes have concerns about geothermal siting. The participants commented that insufficient staff time and attention exist within Federal agencies to process permits in a timely way. Issues regarding the distribution of royalties were also discussed. The participants favored NEPA and California Environmental Quality Act (CEQA); however, they wanted improvement in NEPA and CEQA review processes. The participants noted a similarity with siting issues for wind projects. They wanted a further workshop to continue discussion and produce recommendations.

Workshop Discussion Summary

Introduction

From a discussion among the participants at the day-long workshop, a general consensus emerged about the nature of problems facing geothermal siting at Federal lands, as well as suggested solutions to the problems. The workshop participants agreed that significant barriers to the development of geothermal energy exist. Barriers arise as a result of the complex processes required for permitting geothermal power plants, as well as the length of time those processes require. Some Federal leases have been pending for a decade. Permitting processes are so prolonged, expensive, and time consuming that U.S. companies now say they are unwilling to apply for permits to site geothermal plants at Federal lands. If geothermal companies will not attempt to obtain leases or to apply for facility siting permits at Federal lands, geothermal energy development will cease, and the Nation will lose an important opportunity to develop clean, renewable energy resources.

This summary of the discussion notes from the geothermal facility workshop has been organized into ten categories: national policy, National Environmental Protection Act (NEPA) processes, social impacts of geothermal development, data on geothermal energy, Federal agency roles, competing national values, coordination among Federal agencies, up-front capital costs, royalties, and public and governmental support. In addition, a geothermal siting success story is included. Although the categories are interrelated, they are used as a heuristic device to highlight the discussion's major themes. This summary is intended to be a synthesis, not an interpretation, of views. Each point in the summary is attributable to one or more of the participants, but to foster candid discussion, it was agreed at the discussion's outset that comments would not be attributed by name to any participant.

National Policy

Problem

The participants said that the largest problem the geothermal industry is facing is the lack of a general Federal government policy to promote geothermal development. Does national policy support mitigation for global warming? Does it strongly support development of renewables? Does it foster increased energy supply? In the participants' view, the Geothermal Steam Act of 1970 was intended to promote geothermal development, but its impact was lost. The participants said that the lack of national policy also means that the geothermal industry has to meet stringent siting standards that deter geothermal energy development.

Suggested Solution

The participants said a national renewable energy policy—expressed in Federal legislation or an executive order—should direct Federal agencies to treat geothermal resources as protected resources that can be accessed now and in the future. The participants suggested that the geothermal industry should lobby Congress in favor of such a policy.

NEPA Processes

Problem

In the participants' view, NEPA requirements slow project permitting. NEPA is purposely set up to ensure that permitting processes are sufficiently complete that consideration will be given to potential adverse consequences of a project and to their mitigation, participants said. Because the ultimate decision on geothermal siting resides with BLM, the participants discussed whether a DOE-sponsored programmatic EIS for geothermal energy would add value to the process. They noted that because individual EISs and EAs address certain general points repeatedly in separate impact statements for each permit application, EISs and EAs are redundant and wasteful. For example, each individual project EIS must separately address national policy on global warming and development of renewable energy resources.

Suggested Solution

The participants concluded that a programmatic EIS for geothermal energy would be helpful in speeding permit application processes at specific geothermal sites. The participants did not resolve the question of whether DOE or BLM (or both) should sponsor such an EIS. However, the participants noted that a programmatic EIS would not take the place of project-specific EISs, which would be focused on site-specific issues.

The participants also noted that NEPA processes for geothermal projects should be integrated with preliminary project designs and should include alternative evaluations and crosscutting technologies such as combining concentrated solar with geothermal.

Social Impacts

Problem

The participants did not question the need for environmental reviews for geothermal projects,¹ but they did emphasize that factual information and "due process" are currently lacking and, in their view, are sorely needed. The participants particularly underscored the need for contemporary empirical information in the area of socioeconomic and cultural values.

The participants discussed the part of the permit application process involving Section 106 of the Historic Preservation Act.² In their view, the fate of significant decisions is considered based on assertions, but with few empirical facts. The participants noted that the process in California is quasi-judicial, which at

¹The National Environmental Policy Act of 1969, as amended, requires environmental impact statements and environmental assessments in connection with proposed Federal actions. Also the California Environmental Quality Act (CEQA) requires environmental reviews as well for actions in the State of California.

²The National Historic Preservation Act of 1966, amended in 1992, establishes a Federal policy of encouraging preservation of cultural resources for present and future generations. The Federal lead agency for a proposed action is responsible for initiating the "Section 106" review process and for consulting with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP).

least requires some factual evidence—in their view, unlike the Federal processes when addressing social impacts.

The participants expressed frustration with a recent geothermal facility siting decision in eastern California denying a permit for a proposed geothermal plant at Telephone Flat in the Medicine Lake area. Although the application for the Four-Mile Hill project in the area was approved, the application for the Telephone Flat geothermal project was denied. A geothermal company already held a geothermal lease with BLM for development rights at Telephone Flat. Native American values were a key consideration in the Medicine Lake area.³ In the permit application review, it was determined that three tribes would be significantly and adversely affected by the proposed project.

The participants said that, although biological and physical impacts of geothermal siting are well understood, socio-economic impacts are the “missing part.” They noted that some Native Americans may have felt they were not adequately compensated in some specific geothermal project plans, such as the Telephone Flat project at Medicine Lake. Also, those with vacation homes near designated wilderness areas are powerful in stopping geothermal projects that they perceive can impact them, the participants said.

The participants said that the lack of data on contemporary social impacts and the lack of social analysis over the past 20 years is now harming the geothermal industry and hampering the Federal government’s ability to deal effectively with geothermal permit applications. They said that both perceptions and analysis are important, including a social analysis on a programmatic basis. Today, they said, industry project managers deal with these kinds of issues. The participants believe that social impacts of geothermal development is a high priority issue for research and analysis.

Suggested Solution

The participants noted that, in the area of social impact assessment, the lack of contemporary systematic data is perceived to constrain the siting of geothermal facilities. They believed that it is critical to improve permit approval processes by incorporating sound current empirical information in the area of socioeconomic impacts and values.

The discussion addressed whether giving a share of Federal royalties from geothermal development to Native Americans would be possible, but no conclusion was reached.

The participants strongly recommended that research on the social impacts of geothermal should be conducted and that a workshop similar to the one on siting issues should be convened to discuss these issues with potentially interested groups.

³ In the case of Medicine Lake, the USFS, as the Surface Managing Agency, initiated the Section 106 review process. The review included such issues as protection of Native American graves, archeological sites and resources, and paleontological resources. The American Indian Religious Freedom Act of 1978 holds that Federal agencies shall protect and preserve the religious freedom of American Indians. Executive Order 13007 of 1996 provides that Federal agencies are required to accommodate access to and ceremonial use of sacred sites by Indian religious practitioners and to avoid adverse effects to sacred sites and to maintain their confidentiality. The Act requires that, for any proposed action, agencies ascertain the impacts of the proposed activity on places of religious significance, sacred sites, plant species for food and healing, air quality, visual quality, noise quality, wildlife and game habitat, spiritual significance, battlegrounds, vision quest, power places, and other tribal activities, such as hunting, camping, and gathering.

Data on Geothermal Energy

Problem

The participants identified a lack of current information on geothermal energy and its benefits and impacts. A lack of current engineering data was also noted. The participants said existing information is outdated.

Solution

The participants said that DOE should develop credible scientific information about geothermal energy and its benefits and impacts.

Federal Agency Roles

General

Problem. The participants noted that recent administration policies designed to reduce the size of government have led to reductions in the size of Federal staffs.

Solution. Appropriations are needed to create permanent staff over the next several years at BLM, FWS, and USFS to deal effectively with geothermal facility siting, while also administering siting-related laws. For example, BLM staff is responsible for planning, inspection, NEPA compliance, and permit review that cuts across several programs. Participants estimated that BLM needs five new full-time employees in the State offices and two new full-time employees in the Washington, D.C., headquarters office, which would cost approximately \$1 million per fiscal year. BLM is planning to request increases in full-time employees for fiscal year 2002.

BLM and DOE

Problem. Although, according to the Geothermal Steam Act of 1970, the BLM is the lead Federal agency in geothermal siting, the participants said that BLM leadership in geothermal energy is lacking. DOE has the lead in geothermal program development, but DOE lacks the authority to issue siting permits.

Solution. The participants expressed strong support for the idea of increased funding for BLM and a more proactive stance toward geothermal siting on the part of BLM. The participants said that BLM should take the lead role in being a clearinghouse for geothermal EIS information. They also suggested that BLM take the lead role in being an ombudsman for the EIS process.

The participants also suggested that BLM authority should be expanded to include sole permitting authority for off-lease facilities on Federal lands directly related to the construction and operation of on-lease geothermal facilities.

USFS

Problem. The participants said that most existing information about geothermal resources comes from private lands, but few data exist characterizing geothermal resources on Federal lands. Yet, most of the

geothermal resources in the United States are in the West, and a great proportion of Western lands are owned and managed by the Federal government. Although BLM is the lead Federal agency in geothermal siting, USFS manages the USFS lands where a good deal of geothermal resources are located. USFS has its own permitting processes for activities on USFS lands, such as timber harvesting. The permitting process for USFS is separate and different from BLM leasing procedures. In the case of geothermal resources, BLM seeks USFS concurrence with permitting decisions once a geothermal lease is already in place.

The participants said that the USFS has regulations that exclude explorations subject to NEPA up to a certain size, which expedites the decision process. The three types of documents required for permits, in decreasing order of rigor, are (1) environmental impact statements (EIS), (2) environmental assessments (EA), and (3) "categorical exclusion." A USFS district ranger does not have authority to decide on the first two categories, but can make a decision on a categorical exclusion for exploratory activities that do not add new surface disturbances to a prior disturbance that has already been permitted. For example, if a geothermal company wanted to do a geophysical survey and take soil samples using existing logging roads, USFS could permit this activity under a categorical exclusion. If the USFS grants a permit for exploration, a geothermal company can determine whether a geothermal resource is present and whether it is of sufficient magnitude to warrant development. They can then decide whether to apply to BLM for a lease.

Transmission line siting is also considered critical to geothermal development, and the lines often must cross USFS lands. In these cases, USFS would have to issue a permit for the transmission lines.

In addition, the participants said that USFS staffing is inadequate to deal with geothermal issues; siting decisions are delayed because of this inadequacy. Also, participants said Federal agencies are seen as having different organizational cultures. The participants saw industry's perception of the USFS as almost impossible to deal with: "If the project is on National Forest land, forget it."

The participants pointed out that, for example, in the State of Washington, every known geothermal acre is on USFS land. The industry has applied for leases on one million acres and only 50,000 acres have been leased. The participants said geothermal companies potentially interested in Washington's geothermal resources will not even try to develop a project there.

The participants identified a "Catch-22" situation in geothermal energy. The USFS often withholds permits for exploration, thus preventing geothermal development. The geothermal industry does not want to invest without a lease, yet companies strongly prefer that the land be leased before they explore for geothermal resources. If Federal land is explored without a pre-existing BLM lease and geothermal resources are discovered, the Steam Act requires that the area be declared a Known Geothermal Resource Area (KGRA), which means it automatically must go up for competitive bid. Companies can only develop geothermal if it makes economic sense. The participants said that problems with a site often become apparent more quickly than does the site's geothermal resource potential, which makes it difficult to "sell" exploration. Before too much money is invested, a company needs to protect its interests with a lease application. Participants identified the difficulty of companies covering costs up-front without knowing the benefits to come.

Suggested Solution. The participants said that USFS plans for each national forest and their guidelines on minerals potential must be developed and submitted to Washington, D.C., early in 2001. USFS has new regulations for revising forest plans, and these plans will address how to protect resources.

The participants said the geothermal industry should get involved with USFS in the development of Forest plans under the revised regulations.

Another suggested solution was that DOE should work with the Federal Energy Regulatory Commission (FERC) to ensure transmission access for geothermal power.

FWS

FWS is responsible for administering the Endangered Species Act. Information provided by FWS prior to the workshop indicated agency concerns that geothermal development might reduce the flow of water into lakes or might alter factors affecting the survival or reproduction of fish species, such as temperature and alkalinity. The Borax Lake tui chub and the Fosssett speckled dace were mentioned as examples. The participants also cited spotted owl habitat as an example of a species-protection issue related to geothermal facility siting.

The participants noted that compliance with the Endangered Species Act is specific to each site. One participant said that these concerns could be managed and impacts mitigated, but the FWS has to be involved to help define impacts and mitigation strategies. The participants said that geothermal exploration involves the need to drill slim holes and gradient holes, which could raise fish and wildlife issues, such as those related to Borax Lake. The participants said that when a geothermal company explores and detects a potential fish and wildlife problem, it may stop further activity immediately without even trying to find out more about the FWS process or potential mitigation strategies.

Power Administrations

One participant said that the Western Area Power Administration (WAPA) is aggregating “green tags” on behalf of DOE and is trying to aggregate green tags in California.⁴ But WAPA currently has no program to foster green power. Green certificate programs would help to establish markets for geothermal power.

Competing National Values

Problem

The participants pointed out that the Geothermal Steam Act of 1970 assigned the U.S. Department of Interior (DOI) with the responsibility for geothermal development. Originally, the U.S. Geological Survey managed the minerals leases, and permitting processes took 2 years. Later, the responsibility for administration of the Geothermal Steam Act was assigned to BLM. Many national policy issues have converged to discourage permitting for geothermal facilities, including preservation and conservation of wilderness areas, national monuments, and roadless areas. Furthermore, Executive Order 13123 states that Federal agencies must purchase electricity from renewable resources, with emphasis on wind

⁴“Green tags” or green certificates are sold separately from electricity to reflect the price premium associated with environmental attributes. In some regions of the country (such as the Los Angeles Department of Water and Power), customers can purchase green certificates instead of subscribing to a green-pricing program. Generally, green certificates are issued by the power developer, such as a wind power developer who sells power into a market and can sell the price premium.

resources. No mechanism currently exists to weigh and balance these competing values where and when a geothermal facility is proposed. Participants said that valid policies can conflict and the one that prevails is the one with the most political support in the process.

Suggested Solution

The participants said that a mandate is needed for the Federal agencies involved to cooperate with one another about and streamline NEPA processes. The participants suggested that an interagency committee could help with managing the resolution of competing national values and missions. A Federal interagency committee would involve high-level personnel from DOE, U.S. Department of Agriculture (USDA), DOI, and FWS. It could have subcommittees at other levels (e.g., the DOE Geothermal Program Manager, the Mineral Management Service (MMS), the U.S. Environmental Protection Agency (EPA), chief foresters from USFS, and BLM staff from local areas) to update and streamline Federal issues and requirements to decrease barriers to the use of geothermal energy. The participants said that the interagency committee could identify needs and recommend changes to decrease barriers to the use of geothermal energy (including access for exploration, leasing, environmental considerations, royalties, and incentives). The participants said that this approach would provide the top-down authority needed for changes in geothermal siting policies and procedures. The participants said the Interagency Committee could make recommendations to Congress via the President, driven by Cabinet members, to improve geothermal siting processes.

Coordination among Federal Agencies in Permitting Processes

Problem

With regard to permitting processes, the participants pointed out that Federal program managers have little incentive to take a project “under their wings.” This would require daily management by the agency and the industry, representing a budgetary drain. Also, because there is no constituency for geothermal energy, the agency is not rewarded for prompt attention to siting processes.

Suggested Solution

The participants said that timely siting and permitting decisions for Federally funded projects that meet procedural requirements could be enhanced by the formation of individual project task forces. The participants suggested that whenever Federal funding is involved in siting a geothermal project, DOE could require the involvement of a project task force consisting of members from industry, DOE, BLM, USFS, State agencies, environmental organizations, and local governments to enhance permitting and construction of the specific project.

A project task force could lay out a project roadmap, establish communications among decision makers, define a set of consistent rules and procedures (including dispute-resolution procedures), and accelerate implementation of the siting and permitting process. It could follow a time frame established at the outset of the application process.

Up-front Capital Costs

Problem

The participants said that current policies make no allowance for large, risky, up-front investment needed to construct a geothermal plant. Geothermal companies must borrow capital (for example, \$100 million) to invest in power plant development; investment lenders have requirements for getting their investment back. Site control is a key consideration. Lenders require that companies own something more than a geothermal lease for the length of operations. Geothermal plants are characterized by high initial capital investments and low operating costs because there are no fuel costs. Up-front costs include drilling all wells, obtaining required permits, building the plant, and building transmission lines. Geothermal companies must also get long-term power contracts; without permits for siting, this is difficult. It is impossible for small companies to fight the bureaucratic maze, the participants agreed. Site licenses have been used to get credit, but it is difficult to do this.

The participants noted that geothermal projects typically use only 5% to 10% of the land in a project area, far less than either wind or solar projects. At Medicine Lake, only 20 acres out of the 700 acres allocated for the site were planned for use. The participants also pointed out that construction of a geothermal power plant consumes only 30% of the time (and 90% of the cost) of getting a project built; the other 70% of the time (and 10% of the cost) is spent on environmental document preparation and permit applications, exploratory drilling, obtaining loans, and so on. The participants said that, from the perspective of capital, geothermal is an extremely risky business.

Suggested Solution

The participants mentioned several possible solutions.

- \$ BLM should deed land to companies for the duration of the geothermal facility. After that the land would revert to the Federal government.
- \$ Low-interest or no-interest loans would help reduce risk to industry and put more “onus” on the government to move geothermal forward. This could be similar to the Rural Electrification Association (REA) loans the government made to electrify the West. Could the REAs that powered the western United States be a model for developing geothermal resources in the West? The contemporary REAs have geothermal resources, but they are currently choosing oil and gas.
- \$ It would be an incentive to industry if royalty payments were based on output and were reduced by the amount of capital investment in the plants. For direct-use projects, the MMS should look at the energy produced by the geothermal well. As procedures stand now, no incentive exists to use the resource efficiently.
- \$ A 10-year moratorium on new geothermal project royalties would also be an incentive. However, it was pointed out that States and localities want their share of the royalties.
- \$ The geothermal industry needs a production tax credit across the board for geothermal.

- \$ EO 13123 has mandated Federal agencies to buy green. Participants believe that DOE has a mandate to buy 3% of its electricity from green power by 2004 or 2005 and then 7.5% by 2010. The participants said a plan is needed to make nearby renewable resources available to Federal agencies, including geothermal resources.
- \$ Over the years, Congress has appropriated funds for hydropower projects; for example, they constructed the Navajo Generating Station. These Federal investments were paid back in 50 years, the participants said. The participants believe that if Congress were to appropriate funds for green power development, this would give the renewables industry confidence that funding and markets will be there if geothermal is developed. Further, green power could be profitable. Even a 5-year program would stimulate geothermal development.

The participants suggested that a national effort to promote geothermal development through financial incentives should be initiated.

Royalties

Problem

Although one participant said geothermal royalties were not, strictly speaking, siting issues, the other participants pursued discussion on this topic. They noted that companies leasing geothermal resources must pay royalties to the U.S. Treasury as a fair return to the public for this resource. When the Geothermal Steam Act was passed, it was thought that a value would be easy to establish. Value is currently set by indirect methods in place since 1992. The royalty itself is not a siting issue because it does not go into effect until production begins.

The participants said that royalties are usually 10%, resulting in a national royalty stream of approximately \$20 million per year. Half of the royalties go to the U.S. Treasury; the other half goes to State and local governments who want their money promptly, participants noted.⁵

It was noted that royalty rates are fixed by statute at between 10% and 15% of the amount or value of the geothermal resource produced from the leased land, and it would take legislation to change them. In California, the royalty rates are 12.5% for Federal leases and 10% for private and State leases. The Steam Act allows BLM to set this rate, the participants said. The California office of BLM set the rate at 12.5% to get additional revenue. Half of this money is returned to the State of California, and 40% of this half goes to California counties, they said.

The participants noted that because geothermal electricity or heat is not subject to a selling arrangement on which to base value, MMS derives the resource's value by indirect methods. In particular, it uses the netback procedure for electrical generation resources and the alternative fuel method for direct-use

⁵Under the Geothermal Steam Act, by reference to the Mineral Leasing Act of 1920, as amended, MMS disburses 50% of the geothermal royalties from each lease back to the State in which production occurred, 40% to the Reclamation Fund, and 10% to the U.S. Treasury's general fund.

resources.⁶ Recently, the participants said, MMS published an Advance Notice of Rulemaking in the *Federal Register* specifically asking for an alternative valuation method.⁷ The participants said that the geothermal power industry opposed any changes in the valuation method, and the geothermal direct-use industry did not comment. Therefore, the participants said, MMS made no change in valuation method.

The participants discussed royalties for direct use as well as for power. Royalty is computed by multiplying the royalty rate by the value. The participants noted that electricity has more value than heat. Royalties are often based on the equivalent heating value of natural gas or other conventional resources, but the end product—electricity—has much more value than heat content, so the participants suggested that the royalties could be based on that. The value of direct use should be the value of the fuel not used.

The participants said they have not heard of projects not being initiated because of the existence of royalties. On the other hand, as noted above, if royalties did not have to be paid, geothermal development would be more financially attractive. This could help companies in dealing with up-front investment costs.

Suggested Solution

The participants said that a royalty holiday could be an incentive for geothermal companies to site facilities at Federal lands. One participant said that the MMS does not have authority to grant a royalty holiday; it would take legislation to do this. The participants said Congress should be encouraged to change the royalty rules for valuation.

Public and Governmental Support for Geothermal Energy

Problem

The participants observed that public support for geothermal development seems to be lacking. Also, public perception seems to have changed in such a way that geothermal siting is going to be difficult in any environmentally sensitive area.

Suggested Solution

The participants stated that outreach and education are important aspects for geothermal siting. They emphasized that marketing geothermal energy and projects should be done in a professional manner. Education and information using contemporary communication techniques as well as public participation are needed, the participants said. Education and outreach apply also to local, State, and Federal decisionmakers who need to be much more well informed. The participants noted that current, consistent information from credible sources is needed.

⁶These methods are defined by regulation in 30 CFR 206.350 et seq., in effect since 1992.

⁷The Advanced Notice of Rulemaking was published on August 19, 1999 (64FR 45213).

A Success Story—the Geothermal Plant at Mammoth, California

The participants said the most successful example of geothermal siting is the Mammoth Plant in California, which first began operations in 1984. The Mammoth geothermal plant is located in the Inyo National Forest. The geothermal industry considers Mammoth as their “poster child,” the participants said. The participants said: “At Mammoth, the industry went across the NIMBY barrier.” The persistence of Pacific Energy, Mammoth’s developer, accounts for much of the project’s success. The Mammoth design started in 1978 and went through a “difficult and expensive” permitting process that took 4½ years. The participants said that the impediments and complaints raised were dealt with effectively by the plant’s designers. For example, participants said, the plant is invisible from the highway, and many people drive right by, not realizing it is there. The plant’s color and shape were designed to blend in with the surrounding landscape, and the plant emits no air or water pollution. Developers felt the Mammoth plant was “fine-tuned” because of opposition to the project, the participants said. The Sierra Club agreed to the plant’s design. The plant was constructed and operating within 13 months after the permit approval. In 1989, an expansion was permitted that began operating in 1990. The participants believed the Mammoth story could serve as a model for successful geothermal facility siting elsewhere.

Vote on Suggested Action Items

During the end of the workshop discussion, the participants generated a list of potential action items that could help resolve the problems they had identified. Through a voting process, the participants assigned the priorities to the action items, resulting in three high-priority and seven medium-priority recommendations for action. At a post-workshop meeting the morning following the workshop, a smaller group of the participants further developed the recommendations, which were transmitted to DOE on December 1, 2000

Summary of High- and Medium-Priority Recommendations from A Workshop on Geothermal Facility Siting at Federal Lands

Participants at the NREL Workshop on Geothermal Facilities Siting at Federal Lands agreed unanimously that certain actions could be taken immediately to improve the processes of geothermal siting at Federal lands. The workshop participants produced a series of recommendations to accomplish this goal that it divided into high, medium, and low priorities. The three highest priority recommendations are as follows.

High-Priority Recommendations

- C Congress or the White House should enunciate a National Renewable Energy Policy stating that it is a priority, consistent with other laws, to develop and expand the use of geothermal and other renewable energy resources at Federal lands. The policy should recognize that it is in the national public interest to expand the use of geothermal as well as wind, solar, biomass, and other renewable resources. Furthermore, Federal and State agencies involved in the siting of these facilities should implement this national policy by giving priority to regulatory decisions regarding renewable energy resources and by modifying their existing land use plans to facilitate access to and development of these renewable energy resources.
- C The DOE should establish, in cooperation with other Federal agencies, a National Geothermal Coordinating Committee (NGCC) that is modeled after the National Wind Coordinating Committee. The NGCC should include broad representation of Federal and State agencies, the geothermal industry, and public interest groups involved in geothermal issues. The purpose of the committee would be to facilitate communication and coordination of information exchange among the parties. The NGCC should meet on a regular basis to consider national consensus actions that facilitate the use of geothermal resources. The NGCC should have a budget for tasks that it determines should be undertaken to foster the development of geothermal resources. The NGCC should not be involved in agency decisions on any particular project or in actions by individual agencies.
- C Federal agencies should expand their efforts to understand the positive and negative social impacts of geothermal siting. Addressing social impacts early and through clear processes is very important to timely geothermal facility siting decisions. Key to facilitating appropriate siting of geothermal facilities at both Federal and private lands are the development of credible contemporary data on social impacts and development of a clear process to resolve issues and reach decisions in a timely manner. Federal agencies should make research on social impacts of geothermal development a high priority and social impacts should be one of the early priorities of the NGCC.

Workshop participants agreed that implementation of these recommendations should become a high priority of DOE.

Medium-Priority Recommendations

Development of Credible Data

DOE should be responsible for developing and updating credible scientific information about geothermal energy and its benefits and impacts. Existing information is outdated. The information should be collected, organized, and disseminated in such a way that staff at Federal and State agencies perceive it as credible for use in Federal decision processes. The information should include peer-reviewed scientific articles and reports, programmatic environmental impact assessments and statements, a national database on geothermal energy, a Geothermal Core Data Book maintained by DOE's Office of Power Technologies, and a consolidated state-of-the-art engineering handbook with contents including steam tables and tower-efficiency tables. The information should be consistent, current, and accessible so that Federal officials could rely upon it. A programmatic environmental assessment for geothermal energy is one way to capture and present reliable information that can be included in the EISs necessary for geothermal siting. DOE should, on a regular basis, publish a peer-reviewed environmental assessment document.

Adequate Funding for Geothermal Programs

If the GeoPowering the West (GPW) initiative is to achieve expanded geothermal electricity production in the United States, the budgets and staffing of the Federal agencies responsible for making regulatory decisions regarding geothermal facilities need to be substantially increased. These increases will make it possible for the agencies to perform their functions in a timely manner. Cognizant Federal agencies include BLM, MMS, USFS, and FWS.

Financial Incentives for Geothermal Development

The vast majority of existing Federal financial incentives go to oil, gas, and coal development in the United States. To foster the national policy for renewable energy development, a national effort should be initiated to promote geothermal energy production and facilitate transmission of geothermal power through financial incentives similar to other energy technologies that the Federal government is promoting. Low-interest loans and tax credits are needed to spur interest and development and to offset the high initial investments necessary for siting geothermal power plants. Tax credits that match those already established for other renewable energy sources should be made available for geothermal development. A production tax credit is especially important to the geothermal industry.

Educational and Outreach Efforts

DOE should increase educational efforts specifically designed for local, State, and Federal decisionmakers concerning geothermal benefits. DOE's priority should be educational and outreach efforts designed to make sure that decisionmakers (including national decisionmakers and DOE officials) and affected communities are especially well informed. Also, DOE should increase the number and effectiveness of public information and education programs.

Exercise of Existing BLM Authority

Federal agencies make major decisions about renewable energy project development on Federal lands. This is particularly true with respect to geothermal resources that are located in the western United States where most of the land is Federally owned. Power plant siting strategies are often shaped by land management legislation and local parochial concepts of land use that do not reflect national priorities and most likely set forth confusing or conflicting criteria that impede the development of renewable energy resources such as wind and geothermal energy. This conflict reflects a lack of national priorities, and as there is no single arbitrator of conflicts, the end result is often litigation. A National Renewable Energy Policy may be able to overcome some of this conflict.

The Geothermal Steam Act (30 USC 1001) directs the Secretary of Interior to make available for exploration and development certain Federal lands through leasing. The act withdraws from entry other specific lands such as national parks and national wildlife refuges. Two laws with the greatest impact on geothermal development are the National Forest Management Act (NFMA) of 1976 and the Federal Land Policy and Management Act (FLPMA) (15 USC 1600, et. seq.; 43 USC 1701, et. seq.) NFMA is implemented by the USFS and requires the USFS to make assessments of renewable resources on lands under USFS management. These assessments are used in the formation of management plans for each USFS district. FLPMA requires the Secretary of the Interior to inventory resources and prepare land-use plans based on those resource assessments. If the potential for the energy facilities is not included or is under-valued in the land management plans of the USFS and BLM under NFMA and FLPMA, conflicting or preemptive land use classifications can and have prevented development of prime geothermal resource sites. BLM should exercise its existing authority and leadership relative to geothermal facility siting. A National Renewable Energy Policy may be able to overcome some of the conflict about renewable energy project development on Federal lands.

Need for New BLM Authority

The Geothermal Steam Act of 1970 as amended (30 USC 1001) gives the BLM the sole permitting authority for siting facilities on Federal lands that are available for geothermal leasing. But BLM is not given authority over other facilities such as transmission lines and access roads that are located off the geothermal lease. Because conflicting Federal land management criteria and conflicting Federal policies regarding priority use or reservation of Federal lands exist, BLM's authority under the Geothermal Steam Act should be expanded. In this way, BLM would have sole permitting authority for off-lease facilities on Federal lands for any facility directly related to the construction and operations of the on-lease geothermal energy facility. This authority should be similar to the Federal Energy Regulatory Commission (FERC) authority for hydropower licensing (18 CFR 4) in which a single Federal agency has the primary authority to grant a license, right of way, or permit after consultation with other Federal agencies, State and local governments, and the public where multiple jurisdictions may be involved.

Transmission Access for Power from Renewable Resources

FERC has authority over multiple agencies. Transmission lines require easements, not rights-of-way. FERC should ensure transmission access for geothermal power. DOE should work with FERC to (1) ensure that national policy regarding renewable energy resources at Federal lands is implemented, and (2) explore ways to resolve of multi-jurisdictional rights-of-way or easement conflicts for renewable energy projects.

Informal Workshop on Geothermal Facility Siting Issues at Federal Lands *Final Agenda*

Organized by Barbara Farhar, National Renewable Energy Laboratory
Karl Gawell, Geothermal Energy Association, and
Joel Renner, Idaho National Engineering & Environmental Laboratory

Date: November 15, 2000

Time: 8:30 a.m. - 5 p.m.

Place: National Renewable Energy Laboratory
Denver West Office Park
Golden, Colorado
Building 27, Conference Room 227 (2nd floor)

- 8:00 a.m. Registration, Continental breakfast with fresh fruit
- 8:30 a.m. Welcome and Announcements
Ron Judkoff, National Renewable Energy Laboratory
Peter Goldman, U.S. Department of Energy
Barbara Farhar, National Renewable Energy Laboratory
Introductions
- 8:50 a.m. Geothermal Facility Siting Issues - An Industry Perspective
Karl Gawell, Geothermal Energy Association
- 9:10 a.m. Geothermal Facility Siting Issues at Federal Lands - Problems and Solutions
David McCain, D.W. McClain & Associates Corp, Independent Consultant
- 9:30 a.m. Geothermal Facility Siting Issues - State Perspectives
Panel - Bob Therkelson, California Energy Commission; Rich Hoops, Speaker for State of Nevada
- 9:50 a.m. Geothermal Facility Siting Issues - Federal Perspectives
Panel - Rich Hoops and Miyosha Stith, Bureau of Land Management
- 10:05 a.m. BREAK
- 10:20 a.m. Geothermal Facility Siting Issues - Federal Perspectives (continued)
Randy Sharp, U.S. Forest Service; Steve Blazek, U.S. Department of Energy
- 10:40 a.m. Facilitated discussion (see attached questions)
- 11:45 a.m. LUNCH - Working lunch
Legal Aspects of Geothermal Siting
John Herrick, DOE, Golden Field Office
- 12:45 p.m. Facilitated discussion, continued

- 3:00 p.m. BREAK
- 3:15 p.m. Presentation of Recommendations from Pre-meeting on November 14, 2000
TBD (group spokesperson)
- 3:30 p.m. Complete discussion, finish recommendations
- 4:45 p.m. Summary, Next Steps
Barbara Farhar
- 5:00 p.m. Adjourn

Desired Outcomes of the Workshop:

- \$ Issues and problems (both manifest and latent) relevant to geothermal facility siting are carefully identified.
- \$ Suggestions for addressing these issues and problems constructively are identified.
- \$ Next steps are identified.

Meetings Associated with the Informal Workshop on Geothermal Facility Siting

Pre-meeting for Informal Workshop on Geothermal Facility Siting Issues at Federal Lands *Agenda*

Date: November 14, 2000
Time: 3:00 p.m. - 5:30 p.m.
Place: National Renewable Energy Laboratory
 Denver West Office Park
 Golden, Colorado
 Building 27, Conference Room 227

Purpose: To discuss the agenda for the Information Workshop on November 15, 2000, and to draft possible recommendations for consideration at the workshop.

Debriefing of Informal Workshop on Geothermal Facility Siting Issues at Federal Lands *Agenda*

Date: November 16, 2000
Time: 8:30 a.m. - noon
Place: National Renewable Energy Laboratory
 Denver West Office Park
 Golden, CO
 Building 27, Conference Room 227

Purpose: To discuss the output from the Informal Workshop on November 15, 2000, and to help write and review the recommendations made at the workshop.

Questions for the Workshop discussion:

- \$ What do members of the geothermal community identify as the most pressing geothermal siting issues and problems? How significant are these barriers to geothermal siting?
- \$ What do members of cognizant Federal agencies identify as the most pressing geothermal siting issues and problems? How significant are these barriers to geothermal siting? What can industry do to make the job of the land management agencies easier?
- \$ What experience do members have with successfully resolving geothermal siting issues and problems? What suggestions are there for dealing with these issues and problems?
- \$ What implications does the change in administration have for geothermal siting issues and what opportunities for change does it represent? Who should be talking to the new administration about geothermal facility siting? When should they do this? To whom should they speak?
- \$ What steps should be taken (i.e., recommendations) to support the geothermal industry in developing geothermal resources when it comes to siting issues and problems? To support Federal agencies? To support State governments?
- \$ Who and what are the best sources of information and data on geothermal siting issues and problems?
- \$ Would additional workshops to address these issues be worthwhile (i.e., as a forum or venue to continue discussion on these issues and to bring high-level agency staff to the table at an appropriate time)? If yes, who should be invited?

Informal Workshop on Geothermal Facility Siting Issues at Federal Lands

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